



THE OPERATING SYSTEM FOR BUSINESS

If you plan to use a minicomputer system in your business or if you plan to base your business on the marketing of business oriented minicomputer systems, the most important decision you face is your choice of an operating system.

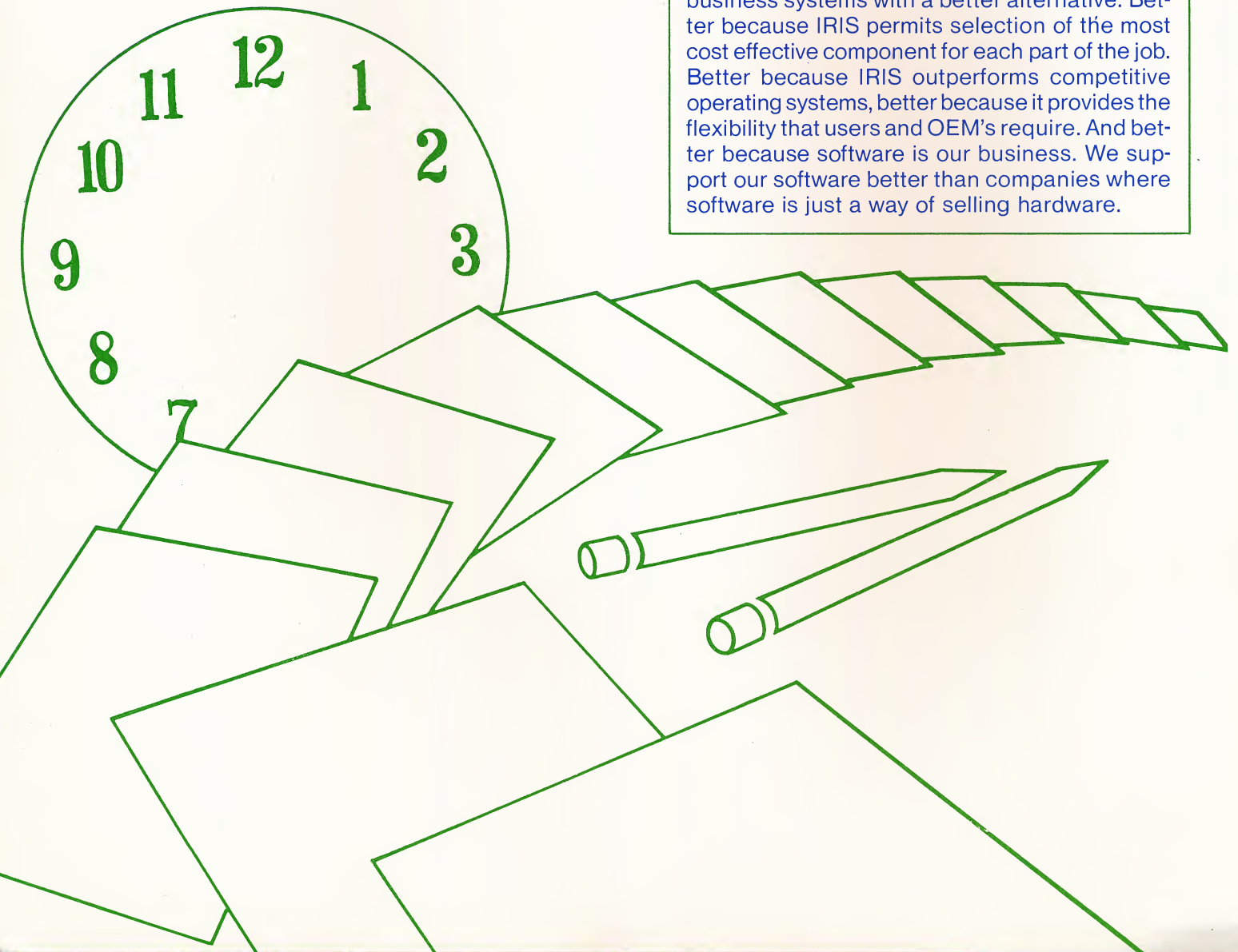
The decision will largely determine 1) your hardware configurations, 2) your hardware vendors, 3) the cost and time required to develop application software, 4) the efficiency of on-line interactions, 5) the number of applications and terminals you can support, and 6) the reliability of your system and ultimately the profitability of your company.

Sources of Operating Systems

Operating systems are available from several sources. You can buy one from any of several large minicomputer vendors, where the price of the operating system is usually bundled in with the hardware. This locks you into his CPU, disc system and other major peripherals — whether or not they are cost effective.

Other suppliers, usually system houses, offer special purpose operating systems built around a single language such as BASIC or COBOL. These tend to be restrictive and not sufficiently flexible to permit their customers to change disc systems, select new peripherals or modify and extend the system software.

Educational Data Systems created IRIS to provide end users and independent suppliers of business systems with a better alternative. Better because IRIS permits selection of the most cost effective component for each part of the job. Better because IRIS outperforms competitive operating systems, better because it provides the flexibility that users and OEM's require. And better because software is our business. We support our software better than companies where software is just a way of selling hardware.



Data Base Management System

INFOTRIEVE, a CRT oriented query system, augments the file structures and data manipulation facilities of IRIS to provide a powerful Data Base Management System.

The following features of INFOTRIEVE make it an important system tool for both the programmer and the system user. INFOTRIEVE:

- ☐ Operates on a wide range of file types: Formatted, Contiguous and Indexed random.
- ☐ Greatly facilitates data base conversion.
- ☐ Eliminates the need for file maintenance utilities.
- ☐ Provides an extremely flexible query capability and permits on-line modification of IRIS files.
- ☐ Operates under its own protective security system.
- ☐ Is very simple to operate.

INFOTRIEVE is designed to operate on any IRIS data base. It is completely self-guiding in operation and does not require any memorization of grammatical formats or protocols. As a result, non-programmers, after a short introductory session, can interrogate their most complex data bases and create special reports to their own specification.

INFOTRIEVE includes all necessary subsystems for definition of files, creation/modification of records and read/write protection of fields for security purposes. The query capability allows the user to search the data base — sequentially, directly or randomly — and identify segments that satisfy relationships of expressed interest. It even allows tracing of pointers from one file to another. Records satisfying the search criterion are displayed on the CRT in easy to understand formats or directed to the printer for hard copy reports. The user may also specify various operations to appropriately modify selected fields of the records that satisfy the search.

An audit trail is maintained of all record modifications. Security locks are used to prohibit access and/or modification on a field by field and user by user basis.

Report Generator

INFORMAT is a general purpose report writer using the selection facilities of INFOTRIEVE and extends the latter's report writing facilities to permit reports of almost any format. All formats are designed interactively at the CRT with no requirement to learn programming techniques. Multiple control breaks permit the accumulation and printing of subtotals and totals. Page headings, column headings, automatic pagination and other format controls are provided. Using INFORMAT, formal reports, exception reports, business forms and projection reports are easily created and saved for future use.

Input/Output Handling

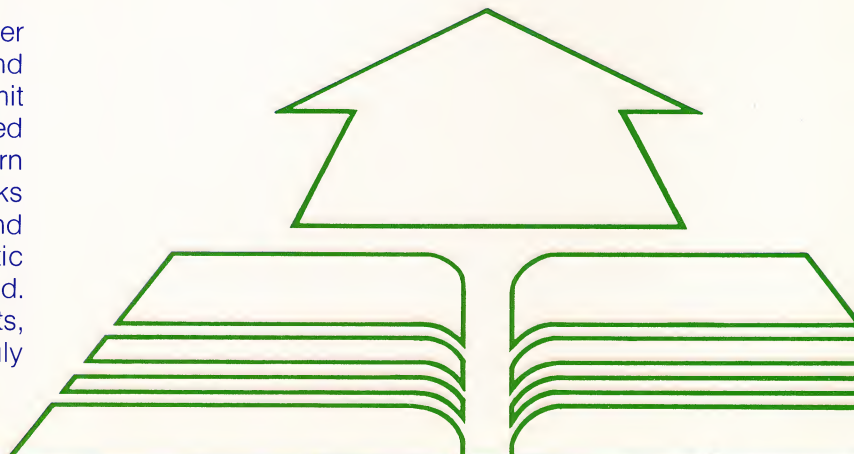
Input/Output devices and mass storage devices may be added to IRIS in any of three different ways, depending on the characteristics of the device and its intended use:

- ☐ As an Interactive Port, a user communicates with processors and runs application programs.
- ☐ As a Peripheral Device, that may be OPENED by any caller granted access; the caller then does input or output by doing a READ or WRITE to the device as if it were a data file, or
- ☐ As a Logical Unit having its own file directory, thus allowing any user granted access to read or write to files on the device.

Communication oriented devices such as typewriters, teleprinters, and CRT terminals are usually treated as Interactive Ports. Devices such as line printers, card readers, paper tape units, cassette tape drives, graphic plotters, data acquisition devices and communication channels are usually interfaced as peripheral devices. Disk memories are usually interfaced as Logical Units. However, a cartridge or floppy disk could be interfaced as a peripheral device for the purpose of transferring data between IRIS and another computer system.

Educational Data System's MIGHTY MUX 310 is a very high performance I/O system for all Nova-type computers and provides for the connection of up to 128 serial I/O terminals. All interactive and peripheral devices may then be handled via the Direct Memory Access (DMA) channel of the computer. With DMA channel operation, an entire message is transferred with only a single interrupt, thus greatly reducing the computer's I/O overhead. Additionally, all device and buffer parameters are under software control on a port by port basis. For example, the baud rate of a terminal can be changed from that terminal or from any other.

An intermediate input buffer allows type-ahead, i.e., entry of data before an INPUT statement is executed.



A complete set of special CRT independent mnemonics in Business BASIC provides access to CRT features such as cursor positioning, end of line or end of screen blanking, or cursor position sensing. These mnemonics are easily adapted to any CRT terminal.

Utilities

IRIS provides a wide range of system command utilities including:

EDIT	Provides for editing of text files, including programs, English text, etc.
ASSEMBLE	Assembles source code to object files for operation under IRIS or stand-alone.
PORT	Permits attributes of any port to be changed.
LIBR	Allows detailed or summary information to be obtained on specified categories of files.
CHANGE	Allows authorized users to modify file characteristics.
QUERY	Permits the characteristics of any file or the status of any account to be determined.
MAIL	Facilitates communication between users at terminals.
INSTALL	Provides for the activation of Logical Units.
REMOVE	Provides for the deactivation of Logical Units.
COPY	Is used to move data of any type from a specified source to a specified destination.
DUMP	Allows a BASIC program to be saved in source form as a text file.
LOAD	Allows a BASIC program in text file form to be converted to the form which can be run.

Other utilities permit the interpretive execution of assembled code, the debugging of system software (three different debugging aids are provided) and the backing up of Logical Units.

Range of Configurations & Throughput

IRIS is designed to operate efficiently with a minimum hardware configuration, and to take full advantage of the additional resources provided by larger configurations. IRIS requires a POINT 4 or Nova-type CPU having 16K words of core, a master terminal, real time clock and a single disk. With a suitable disk (e.g., 5-10 Mbyte cartridge drive) and multiplexer (e.g., MIGHTY-MUX 310), this configuration will support up to 8 concurrent users. Each will have an active file of 4K words for data and program. Programs requiring

more storage may be segmented with the CHAIN statement. In such a configuration, all users can have the use of any or all of the IRIS facilities concurrently. Each active user has an I/O buffer in core and an "active file area" that is swapped in from the disk when processing is required.

As more core memory is added to the system, response time and throughput can be improved, and a larger number of users can be accommodated. This is accomplished by allowing a larger number of system subroutines (Disksubs) to be core resident, by increasing the size and number of I/O buffers, and by providing for multiple user partitions in core. These measures reduce the requirement for data transfer between disk and core, normally the most critical limitation in any disk based system.

These IRIS configuration features are determined by parameters. The system manager may at any time modify these parameters to take advantage of changed circumstances. A parametric approach to system configuration gives the system manager full control of the IRIS hardware environment. As hardware resources change, configuration of the operating system may be quickly and easily modified to make full use of available hardware.

Multiple user partitions are especially important because they reduce the need for the swapping of active files. Full control of the partitioning of available core is provided to the system manager. Typically, one or two partitions can be supported in 32K words of core and five to eight partitions in 64K words, the largest amount of directly addressable core.

Other techniques for increasing the number of terminals that are supported include the use of a head per track disk or extended core bulk storage to give rapid access to active files and other frequently used data, the use of the MIGHTY-MUX 310 multiplexer to reduce I/O overhead as described earlier, and the use of Educational Data Systems' MICRO-N processor to speed up arithmetic operations. Through the use of these techniques, from 32 to 64 terminals can be supported by a standard POINT 4 minicomputer, depending upon the job mix.

Adaptability to Changing Requirements

IRIS is designed to satisfy a wide variety of requirements and to facilitate the enhancement of the operating system by Educational Data Systems or the OEM customer.

- ☐ The system designer or manager can add ports and peripheral devices, change I/O buffer sizes, change the number of channels on which files and peripherals can be OPENed and add new processors, subroutines, and peripheral drivers to the



INTERACTIVE REALTIME INFORMATION SYSTEM

Briefly described: IRIS is a multi-tasking information system that supports real time tasks in foreground, time sharing tasks in midground, and batch processing tasks in background. These tasks are distinguished by over 1000 different priority levels, initialized according to the relative importance of the tasks and modified dynamically to provide suitable response and throughput to each job.

Time sharing under IRIS is performed by the operating system itself, not by the language processors. This means that all processors and utilities can time share, so that different users can enter, compile, edit, debug and run programs in various languages and use various utilities concurrently.

IRIS, a general purpose system, supports multiple languages, including Business BASIC, assembly language, editing and debugging languages, INFO-TRIEVE™ (a Data Base Management System), and INFORMAT™ (a Report Generator). It also supports a host of utilities and a full complement of data file structures.

IRIS operates on the EDSI POINT 4™ or any Nova* type minicomputer with at least 16K words of core, a disk and a real time clock. The disk may be a floppy, cartridge, head per track or disk pack type, or the system may have any combination of these.

A Mature System

IRIS is the most widely used, independently supplied, operating system for POINT 4 and Nova-type minicomputers. It has evolved through two earlier versions and numerous releases over a nine year period. IRIS operates on CPU's of at least six manufacturers, on over twenty-five different types of disk systems, in countries throughout the world. It is used in banks, hospitals, small businesses, medical schools, giant corporations, service bureaus and government agencies for business and scientific data processing, data management and data communication.

Business Basic

Speed and reliability are key factors in the selection of a programming language for business systems. We chose BASIC as our principal application language because it is easily learned, is in wide use and permits interactive programming/debugging. Additionally, the creation of applications software is greatly accelerated.

*NOVA is a trademark of Data General Corporation

We then extended BASIC and adapted it to the requirements of business by adding the following features:

- Extended precision, floating point, decimal arithmetic to eliminate truncation and round-off errors inherent in radix conversion as well as permitting numbers of varying precision (from one word integers to four word floating point numbers) to be combined in arithmetic expressions.
- PRINT USING, simplifies report generation by providing COBOL-like picture formats for columnar number alignment, blanking of leading zeros, floating of dollar signs, asterisk check protection and other requirements of standard business report formats.
- CRT mnemonic characters are used freely in PRINT and PRINT USING statements to simplify cursor positioning and control of all other CRT functions. Table driven operation permits differing CRT's to be used without changing application programs.
- SIGNAL, provides communication between one program and another.
- Extended string processing, includes string variables and expressions, literals, comparison, subscripting.
- Phantom Ports.
- Statements to facilitate declaration and manipulation of all data structures supported by IRIS.

The resulting language, Business BASIC, is particularly well suited to the fast, economical development of on-line, interactive, business and data management systems.

Advanced File Types

The full support of a wide variety of flexible file types is a second key issue relating to the effectiveness of any operating system and the file organizations it supports. This flexibility provides the applications programmer the freedom to choose the data structure that best fits his needs.

Iris File Structures

- TEXT FILES: These files store text as ASCII strings. Disk space is allocated to them automatically as the file grows. They are used to transfer and convert program files and data files from other computer systems. Text files are also used to store English

text for word processing, assembly language source code and BASIC programs. A powerful time shared Editor is provided to manipulate text files. A Manual Printer program is available to format text for printing.

- **FORMATTED FILES:** These files store numbers of any precision and strings of up to 512 characters in records. Each record can be from 1 to 256 words in length and can store from 1 to 64 numbers and strings. Formatted files are dynamically allocated with disk space committed only as it is needed. The file automatically grows as data are entered. A formatted file provides random access down to the item level (unique with IRIS), and requires at most, three disk accesses per READ statement.
- **CONTIGUOUS FILES:** These files, unlike the text and formatted files, require that their size be specified and the disk space be allocated when the file is built. In return, the record length can be any size from one to over 32,000 words, and any item of any record can be read or written in a single disk access. This is the most efficient access possible.
- **INDEXED RANDOM FILES:** These files consist of a data set and one or more directories. The data set is normally a set of records in a contiguous file but it may also reside in a formatted file. Each directory contains an ordered set of keys which IRIS maintains in sorted order. A SEARCH statement quickly locates the record associated with a matching key. This powerful technique allows data to be located using any available key. A search never takes more than three disk accesses with one more to retrieve the data element, and either the data set or the directories can be rapidly updated by inserting, deleting or changing entries. Indexed random files largely eliminate the need for sorting.

AUTOMATIC RECORD LOCKOUT

All files can be locked at the record level so that several users can access and manipulate the same file

concurrently without loss of data integrity. The programmer indicates in his READ statement that the record is to be locked against other users until the update is completed. Any record that is not locked can be freely accessed.

Hashed File Directories

To minimize file access time, all file directory entries are arranged utilizing a very efficient hashing algorithm. This provides much more rapid file access than is possible using conventional linear search techniques.

Dynamic Disk-Buffer Pooling

To further maximize the efficiency of disk file I/O, IRIS incorporates a dynamically allocated pool of disk buffers. The quantity of available buffers may be specified by the system manager. In operation, all single block disk transfers are made through the buffer pool. This greatly reduces the number of actual disk transfers for frequently used data.

File Security

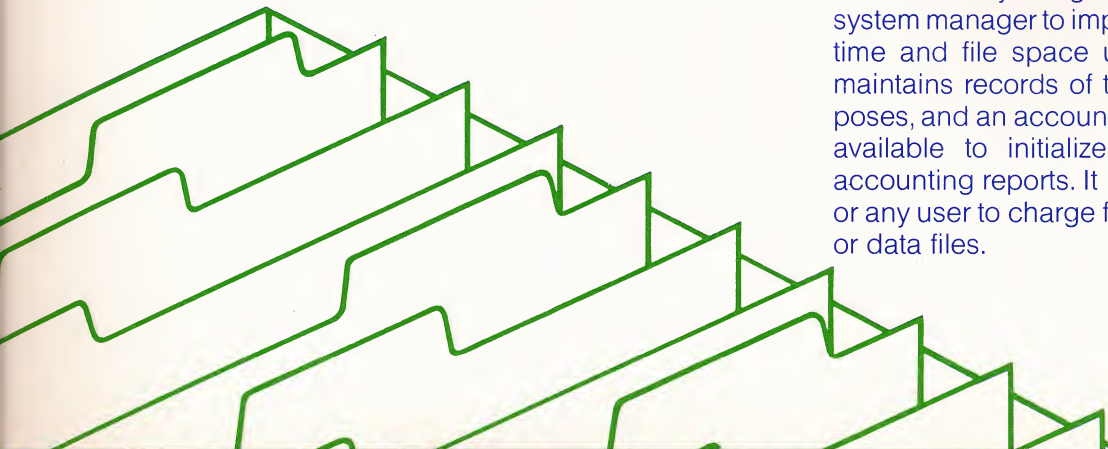
IRIS provides an extensive security system for protection of both program and data files. It includes an optional password in any Filename, three user privilege levels, the ability to read-protect, write-protect, and/or copy-protect any file against users at the same or lower privilege levels. Account ID's and account numbers (group and users) provide additional means of control and identification.

Logical Units

Files are accessed through reference to an IRIS logical unit. Each logical unit contains an index of resident files and a map of available space. A cartridge, pack or other storage device may consist of one or more logical units. System generation parameters determine the size and number of logical units on each storage device.

Facility Usage Accounting

A Facility Usage Accounting System permits the system manager to impose limits on CPU time, connect time and file space used by any user. The system maintains records of the actual usage for billing purposes, and an accounting program written in BASIC is available to initialize these records and produce accounting reports. It is also possible for the manager or any user to charge for the use of selected programs or data files.





system by using the service utility DSP followed by a simple Initial Program Load (IPL) procedure. *No system generation is required to make these changes.*

- ☐ The IRIS Manager Reference Manual describes in detail how to write a language processor, subroutine, or peripheral-driver in assembly language and integrate it into IRIS. This process is greatly facilitated by the use of Educational Data Systems' library of well documented system subroutines.

These and many other system programming facilities make it practical for a system designer to extend IRIS in any direction required to produce the product required in his market. This is accomplished without modification to the IRIS operating system or its processors.

Because of this, Educational Data Systems can continue to support an extended IRIS system under its warranty and supply new IRIS languages and features as they are developed.

Application Software

Many OEM customers will want to develop their own application software. For those who would prefer to leapfrog that development effort, Educational Data Systems markets a growing library of application packages as described below:

MACS-Management, Accounting, Control System

MACS includes the following subsystems:

GLAS General Ledger Accounting Subsystem
ORIS Order Entry, Receivables, Inventory Subsystem
PIPS Purchases, Inventory, Payables Subsystem
PAYS Payroll, Personnel Subsystem

Design Features include:

- ☐ Verification checks are built into every transaction entry; a history file of all transactions is maintained so that the files can be updated from a back-up in the event of system failure.
- ☐ All transactions, after validity checking, are immediately posted to the relevant journals and ledgers, and all other affected files are promptly updated. This implies that the system always reflects the current status of the organization so that on-line inquiries produce accurate results.
- ☐ A complete audit trail is maintained, and users are prevented from erasing journal entries in order to maintain the audit trail. Corrections are always made by correcting entries.
- ☐ The system is parametric and table driven.
- ☐ The customer specifies the chart of accounts, part

numbers, report formats, and other options, and these are entered interactively from the console. Through this technique, the system is adaptable to a wide range of requirements with little or no special programming.

- ☐ Security provisions restrict each user to just those functions and information for which he has been authorized.
- ☐ Tasks are selected from a task menu, presenting to each operator only those tasks he is authorized to perform.
- ☐ Each task is self-guiding as a result of the carefully designed console interactions.
- ☐ Heavy use is made of Indexed Random Files to speed retrieval of vital information through directory searches and to minimize the requirements to sort data.

STYLUS-WORD PROCESSING SYSTEM

STYLUS is a shared-logic multi-terminal, interactive word processing system that can be added to any computer using the IRIS Operating System. It can be combined with accounting software such as MACS to provide both functions from a single minicomputer system.

STYLUS greatly simplifies many of the repetitious and time consuming tasks of daily business. Form letters, contracts and other documents can be individualized, modified, or totally reformatted with little effort.

An organization can establish a large, centralized, text data base under IRIS. Users throughout the organization can then apply STYLUS to retrieve, manipulate and use this shared data base to create and control documents of every kind.

System features include:

- ☐ Proportional spacing
- ☐ Left and Right justification
- ☐ Margin manipulation
- ☐ Automatic centering, indexing, underlining, repagination, letter addressing
- ☐ Tabbing and decimal tabbing
- ☐ Search and Replace – automatic substitution of words and phrases.

READINET-Project Control System

READINET combines interactive computing techniques with classical PERT/CPM time, cost, and resource calculations to produce an on-line, conversational project control system.

All interactions with the system are via CRT terminals. Analyses and reports can be displayed or printed on

Support

Educational Data Systems has a major commitment to IRIS. This is expressed through a vigorous R & D program to extend and improve both the system and application software and through a strong customer support program.

Our software support personnel install IRIS and train the staff of new licensees. They also respond to problem reports and telephone calls for assistance during the warranty period. Under the **IRIS Subscription Service**, licensees can extend their software warranty from year to year. Through this warranty, Educational Data Systems commits itself to correct any deviation from the IRIS specifications.

Subscribers also receive all updates, revisions and new releases of the software.

The company runs a series of regularly scheduled courses dealing with various IRIS related topics:

- ☐ *Introduction to IRIS* ☐ *Marketing of IRIS*
- ☐ *Extending IRIS* ☐ *Installing & Maintaining IRIS*
- ☐ *EDSI Application Packages* ☐ *POINT4 Maintenance*
- ☐ *Multiplexer Maintenance*
- ☐ *Writing Application Software*

New licensees and IRIS Subscription Service subscribers receive credits to attend these classes.

OEM customers who do not wish to provide ongoing software support to their customers can arrange for Educational Data Systems to support their customers directly through the IRIS Subscription Service.

Conclusion

You may now agree that IRIS is the operating system you need to provide the features required in today's competitive marketplace. We are prepared to show you how to:

- Distribute IRIS based systems
- Distribute IRIS application software
- Offer the *only* data base management system for NOVA-type computers
- Reduce your hardware costs
- Speed up your application software development

To find out how, call us at (714) 556-4242 - TWX 910-595-1113 and speak with one of our systems engineers.

command. Projects consisting of any number of activities and events (limited only by disc capacity) can be processed.

Design features include:

- ☐ Multiple projects may be processed simultaneously from different on-line terminals
- ☐ Ending events can be allowed to "float", or held to a fixed date
- ☐ 5, 6 or 7 day weeks may be selected at run time with any number of holidays
- ☐ Up to 16 different resource types may be associated with each activity
- ☐ Time card data and real costs may be reported
- ☐ Budget and expenditures can be calculated based on progress reporting
- ☐ Events and activities can be selected for reporting based on user defined criteria
- ☐ Up to 50 combined parameters and operators may be invoked in a single search of the network
- ☐ Up to 40 different items can be included in any tabular report
- ☐ Nine standard, and any number of user - defined reports are available

HIPS-Hospitality Industry Processing System

HIPS is a complete business system program for the hospitality industry. It has been designed to meet the requirements of most hotels, motels, private clubs, restaurants, and reservation systems. HIPS has completely integrated capabilities for front desk, point of sale and back office operations.

HIPS subsystems provide the following capabilities:

- ☐ Point of sale - performs all accounting for point-of-sale terminals; handles multiple menus and locations.
- ☐ Reservations - maintains status on all reservations, guest charges, and rooms. It updates files as changes in status occur.
- ☐ Receivables - maintains customer account files, charge purchases, point-of-sale transactions, balance reports, debits, credits, statements, transfers, and updates.
- ☐ Payables - maintains vendor files, purchase order generation, invoice records, credits and debits, transfers and updates.
- ☐ General Ledger - maintains master records, posting of entries, details of subsidiary ledger entries; produces statements for receivables and payables, payroll and general ledger activities.
- ☐ Payroll - maintains personnel records, employee earnings, payroll and transfer entry updates.